

PATENT ABSTRACTS OF JAPAN

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(21)Application number : 2000-104729 (71)Applicant : KANSAI PAINT CO LTD

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(54) PRETREATMENT METHOD FOR STEEL SHEET

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a pretreatment method for a steel sheet which allows the execution of welding and fusion cutting without the occurrence of defects in the state of coating the steel sheet with a zinc primer.

SOLUTION: This method consists in coating the steel sheet surface with a zinc primer composition containing (A) a silicon-base inorganic binder and (B) zinc powder of $\leq 5 \mu\text{m}$ in average grain size as essential components at a dry film thickness of 4 to $9 \mu\text{m}$.

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CLAIMS

[Claim(s)]

[Claim 1] The steel plate pretreatment approach which paints and becomes a steel plate side so that it may become the range of 4-9 micrometers by desiccation thickness about the zinc primer constituent which contains (A) silicon system inorganic binder and zinc dust with a (B) mean particle diameter of 5 micrometers or less as a principal component.

[Claim 2] The steel plate pretreatment approach according to claim 1 that the finishing agent of a chromate system is applied after painting a zinc primer constituent.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]**[0001]**

[Field of the Invention] This invention relates to the steel plate pretreatment approach that welding and fusing can be performed, without producing a defect, where a zinc primer is painted.

[0002]

[Description of the Prior Art] In order to prevent the processing and rust generating during an assembly period conventionally on the occasion of construction of iron structural steelworks, such as a vessel, a bridge, a tank, and a plant, the temporary-rust-prevention primer and the so-called zinc primer are beforehand painted on the steel front face in the steel plate side.

[0003] There is an inorganic system which uses as a coat formation component the organic system and ORGANO silicate which use an epoxy resin etc. as a coat formation component, and its initial condensate of hydrolysis in a zinc primer, and the inorganic system with few welding / fusing defects at the time of a processing assembly is used especially suitably. However, the problem of heat deterioration was not necessarily solved for the zinc primer of an inorganic system, either, and the problem of **, such as paint film burning of welding / fusing section circumference and crack separation, still exists. Since the zinc melting point is lower than the iron melting point as for this, it evaporates easily at the time of hyperthermal work, and it is because paint film pores, such as a bit and a blowhole, are generated. For this reason, when there are many especially contents of zinc dust, it is obliged to the activity which removes a zinc primer at the front at the time of welding and fusing.

[0004]

[Means for Solving the Problem] this invention persons came to complete header this invention for welding and fusing being attained by painting the zinc primer containing zinc dust with small particle diameter so that it may become a thin film, without producing a defect, also where a zinc primer is painted, as a result of inquiring wholeheartedly that the above-mentioned problem should be solved.

[0005] That is, this invention offers the steel plate pretreatment approach which paints and becomes a steel plate side so that it may become the range of 4-9 micrometers by desiccation thickness about the zinc primer constituent which contains (A) silicon system inorganic binder and zinc dust with a (B) mean particle diameter of 5 micrometers or less as a principal component.

[0006]

[Embodiment of the Invention] The zinc primer constituent used in this invention contains a silicon system inorganic binder (A) and zinc dust (B) with a mean particle diameter of 5 micrometers or less as a principal component.

[0007] The above-mentioned silicon system inorganic binder (A) Tetra-alkoxy silicate, alkyl thoria RUKOKISHI silicate, The initial condensate of hydrolysis to which the condensation reaction of dialkyl dialkoxy silicate, these partial condensation products, and/or them was carried out under existence of water and an acid catalyst can be used. As tetra-alkoxy silicate, for example Tetramethoxy silicate, Tetra-ethoxy silicate, tetra-propoxy silicate, tetra-isopropoxy silicate, Tetra-butoxy silicate, tetrapod iso butoxy silicate, ethyl silicate 40 (product made from Japanese KORUKO-TO), etc. are mentioned. As

alkyl thoria RUKOKISHI silicate For example, methyl trimethoxy silicate, MECHIRUTORI ethoxy silicate, Methyl tripropoxy silicate, ethyl trimethoxy silicate, ECHIRUTORI ethoxy silicate, etc. are mentioned. As dialkyl dialkoxy silicate For example, dimethyl dimethoxy silicate, dimethyl diethoxy silicate, diethyl dimethoxy silicate, diethyl diethoxy silicate, etc. are mentioned. These are independent, or two or more sorts can use them, mixing. Moreover, moisture powder type colloidal silica and solvent distributed colloidal silica may be used together to the above-mentioned silicate.

[0008] Moreover, as a binder component, metal alkoxides other than silicon, metal colloid, polyvinyl alcohol resin, etc. may be mixed and used for the above-mentioned silicon system inorganic binder if needed.

[0009] As the above-mentioned zinc dust (B), if it is 5 micrometers or less in mean particle diameter, especially, it can be used without a limit and a spherical particle, a flat-like particle with an average major axis of 5 micrometers or less, etc. will be mentioned mostly. If the mean particle diameter of this zinc dust (B) exceeds 5 micrometers, since it will become difficult to use the paint film obtained as a uniform thin film, it is not desirable. The loadings of this zinc dust (B) are coating solid content conversion, and 65 - 85% of the weight of within the limits is preferably suitable for them 50 to 90% of the weight. Since a paint film will become weak if the rust-proofing nature of the paint film from which the loadings of this zinc dust (B) are obtained at less than 50 % of the weight is inferior and it exceeds 90 % of the weight, it is not desirable.

[0010] It responds to the above-mentioned zinc primer constituent at the need. As pigment components other than the above An extender, a usual rust preventive pigment, and a usual color pigment can be used. For example, talc, A mica, a barium sulfate, titanium oxide, Lynn-ized iron, MIO, a lead cyanamide, Zinc chromate, phosphoric-acid zinc, calcium phosphate, metaboric acid barium, Molybdic-acid zinc, molybdic-acid aluminum, red ocher, a cyanine system color pigment, carbon black, etc. are mentioned, and the ingredient further used for coating of electrodes, such as silica powder, rutile powder, and zircon powder, can also be used. Also about these pigments, it is usually desirable for mean particle diameter to be 5 micrometers or less from the point which forms a uniform thin film.

[0011] The usual additives for coatings, such as an organic solvent, a sedimentation inhibitor, a dripping stop agent, a wetting agent, a reaction accelerator, and an adhesive grant agent, may be further blended with a zinc primer constituent suitably if needed.

[0012] The above-mentioned zinc primer constituent can save the liquefied component which can adjust according to a conventional method, for example, contains a binder component, and the powder component containing zinc dust in another container, and can mix both just before use.

[0013] It paints and this invention approach becomes a steel plate side so that it may be set to 4-9 micrometers by desiccation thickness in the zinc primer constituent obtained as above-mentioned. Since welding and fusing nature are inferior when this thickness is inferior in film formation nature and anti-corrosiveness and exceeds 9 micrometers in less than 4 micrometers, it is not desirable. As for a steel plate side, it is desirable to remove rust, a scale, etc. Well-known means, such as an air spray, airless spray, and a brush, can perform paint of the above-mentioned zinc primer constituent conventionally.

[0014] It is suitable that a finishing agent is applied on it after painting the above-mentioned zinc primer constituent from the point of rust-proofing nature by this invention approach. As a finishing agent, a well-known thing is [that there is especially no limit] especially usable conventionally, and the finishing agent of a chromate system is suitable.

[0015] As a chromate system finishing agent, spreading mold chromate treatment liquid is mainly mentioned, a silica particle is added further and, specifically, the water-soluble organic macromolecule resin containing a carboxyl group and the thing which it comes to adjust to pH 2.0-3.5 can be used for the processing liquid which uses the water-soluble chromium compound of 1 - 100 g/l, and the sulfuric acid of 0.2 - 20 g/l as a principal component by chromium metal conversion. 20 - 40% of the weight of the range may be preferably suitable for this processing liquid 50 or less % of the weight, and the content of the chromium in a total chrome may be what added fluoric acid, the metal ion of optimum dose, for example, Zn²⁺, Co²⁺, Fe³⁺, etc. and other mineral acids, for example, a phosphoric acid, etc. to this if needed. As for this organic macromolecule resin, it is desirable that it is within the limits of

mean molecular weights 1,000-500,000, for example, vinyl butyral resin, acrylic resin, etc. are mentioned and 5 - 15% of the weight of within the limits is usually suitable for the addition to the solid content in processing liquid at resin solid content. Although there are a dry type silica (fumed silica) and a wet silica (a silica sol, colloidal silica) in this silica particle, a dry type silica with few silanol groups can use it for a particle front face suitably. It is appropriate for the addition of this silica particle to choose so that it may become within the limits of 30 / 70 - 50/50 by the weight ratio to the amount of total chromes.

[0016] Well-known means, such as an air spray, airless spray, and a brush, can perform the method of application of the above-mentioned finishing agent conventionally, and about [200-400mg //m] two are suitable for the coverage.

[0017] It is suitable from the point of welding and fusing nature that the sum total thickness (desiccation thickness) of said zinc primer layer and the above-mentioned finishing agent layer is 10 micrometers or less in this invention.

[0018]

[Example] Hereafter, an example is given and this invention is further explained to a detail. The "section" and "%", the "weight section" and "% of the weight" are meant, respectively.

[0019] The "ethyl silicate 40" (product made from Japanese KORUKO-TO) 100 section, the "Snow tex ST-0-33" (Nissan Chemical Industries, Ltd. make, SiO₂ 33% of moisture powder type colloidal silica) 20 section, and the ethanol 180 section were put into the example of manufacture manufacture 1 reaction container of a silicon system inorganic binder, it kept at 40 degrees C, and the 2-N hydrochloric-acid 0.4 section was dropped over 1 hour, stirring. After dropping termination, keeping at 40 degrees C, stirring was continued for 1 hour and the binder (A-1) (20% of solid content) was obtained.

[0020] The "ethyl silicate 40" (product made from Japanese KORUKO-TO) 100 section, the water 10 section, and the ethanol 130 section were put into the example of manufacture 2 reaction container, it kept at 40 degrees C, and the 2-N hydrochloric-acid 0.5 section was dropped over 1 hour, stirring. After dropping termination, keeping at 40 degrees C, stirring was continued for 1 hour and the binder (A-2) (20% of solid content) was obtained.

[0021] Each component shown in the binder obtained by the creation above of a zinc primer in Table 1 was blended, mixing and stirring of were done, and each zinc primer a-k was obtained. - (notes 1) (notes 11) of front Naka is as follows.

"LS-2":Mitsui Mining & Smelting coating chemical-industry company make, zinc dust, mean particle diameter of 3.5 micrometers (notes 2) "LS-4" : The Mitsui Mining & Smelting coating chemical-industry company make, (Note 1) Zinc dust, mean particle diameter of 4.2 micrometers (notes 3) "LS-6" : The Mitsui Mining & Smelting coating chemical-industry company make, Zinc dust, mean particle diameter of 6.5 micrometers (notes 4) "#F" : The Sakai Chemical Industry Co., Ltd. make, Zinc dust, mean particle diameter of 3.8 micrometers (notes 5) "#1" : The Sakai Chemical Industry Co., Ltd. make, Zinc dust, mean particle diameter of 5.0 micrometers (notes 6) "F-3000" : Made in Honjo Chemical, Zinc dust, mean particle diameter of 3.7 micrometers (notes 7) "F-500" : Made in Honjo Chemical, Zinc dust, mean-particle-diameter rutile powder of 7.5 micrometers (notes 8) : KINTEIMA tex company make, Mean-particle-diameter [of 10.0 micrometers (notes 9)] detailed rutile powder: KINTEIMA tex company make, mean-particle-diameter silica powder:Takehara chemistry company make and mean-particle-diameter [of 5.9 micrometers (notes 11)] detailed silica powder:Takehara chemistry company make, mean particle diameter of 4.1 micrometers [0022] of 1.0 micrometers (notes 10)

[Table 1]

ジンクリーナー	a	b	c	d	e	f	g	h	i	j	k
A-1		40	40	40	40	40	40	40	40		35
A-2	40									40	
LS-2 (注1)	60		30	40							
組成 LS-4 (注2)									35		
LS-6 (注3)						40	35				65
#1 (注4)										60	
#F (注5)	60										
F-3000 (注6)				60							
F-500 (注7)					60						
研磨粉						10					
微細シリカ 粉		10							15		
消泡粉							15				
微細シリカ 大粉			5								

[0023] Each zinc primer obtained by the one to paint examples 1-5 and example of comparison 5 above was added at this if needed, viscosity control of the ethanol was carried out, it painted with the air spray, it dried in ordinary temperature for seven days, and each color card was obtained so that it might become the thickness shown in Tables 2 and 3 on a test panel (it changes with performance tests) (desiccation). The following performance test estimated each obtained color card. A result is shown in Tables 2 and 3.

[0024] If needed, add ethanol to this and viscosity control of examples 6 and 7 and the example 6 of a comparison, and each zinc primer obtained by the 7 above is carried out to it. The finishing agent which paints with an air spray and is shown subsequently to this table after desiccation so that it may become the thickness shown in Tables 2 and 3 on a test panel (it changes with performance tests) (desiccation) was applied with the air spray so that it might be set to 1 micrometer by thickness (desiccation), and it dried in ordinary temperature for seven days, and each color card was obtained. The following performance test estimated each obtained color card. A result is shown in Tables 2 and 3. In addition, the (notes 12) of front Naka and the (notes 13) are as follows.

"KOSUMA 150":Kansai Paint [Co., Ltd.] make, a chromate-treatment agent (notes 13)

"ARUDEKKUSU": (Note 12) Japanese SHIBI chemical company make, a chromate treatment agent (performance test)

(*1) Film formation nature : visual observation and the thickness measurement (20 places/(sheet)) by the

electromagnetic thickness gage estimated the film formation nature of the color card which was ground by sandpaper #1000 and which was polished and was obtained as above-mentioned, using a mild steel plate (150x70x1mm) as a test panel.

[0025]

It is exterior homogeneity, standard deviation is or less 10:exterior homogeneity, and standard deviation exceeds 1. : O With an or less 2**:exterior ununiformity It is remarkably uneven and a steel plate base is accepted. and standard deviation -- 2 -- exceeding -- a less than [3] x:exterior -- And rust-proofing nature to which a standard deviation exceeds 3 (*2): The salt spray test (JIS 5400 9.1) was presented with the color card obtained as above-mentioned, using the steel plate (150x70x3mm) which carried out shot-blasting processing as a test panel for 100 hours, and the generating condition of rust was evaluated.

[0026]

O : -- completely -- abnormalities-less O: -- rusting -- ***** -- small -- generating **: -- about the color card with which **** obtained the steel plate (SM50A) whose generating x:**** is generating (*3) fusing nature:300x100x12mm remarkably as above-mentioned, using as a test panel what carried out shot-blasting processing The-laser cutting machine "TF2500" (made in the Tanaka factory) was used, the rupture test was performed with 1m cutting speed for /, and the granularity of a cutting plane was evaluated in accordance with the criteria of granularity shown in WES2801.

[0027]

About the color card obtained as above-mentioned, using as a test panel what exceeded : with a class [the / 2nd] of the class [1st] : 50 or less s 50s, exceeded : with a class [the / 3rd] of 100 or less s 100s, and carried out shot-blasting processing of the less than [200s] (*4) weldability:300x100x12mm steel plate (SM50A) The welding wire "SF-1" (Japanese iron welding operator business company make) was used, the weld examination was performed the condition for 1m/of speed of travel with the water flush-fillet-welding posture of carbon-dioxide-gas welding process, and the number (per m) of the pit generated in the 2nd bead and the generating number (per m) of a blowhole estimated.

[0028]

O More than less than [more than less than / :10 piece / **:10 30 piece] x:30 piece [0029]

[Effect of the Invention] According to this invention, welding and fusing are attained by painting the zinc primer containing zinc dust with small particle diameter so that it may become a thin film, without producing a defect, also where a zinc primer is painted. If the finishing agent of a chromate system is furthermore applied on a zinc primer layer, since penetration rust-proofing nature will be raised in this zinc primer layer, it is suitable.

[0030]

[Table 2]

		実施例						
		1	2	3	4	5	6	7
ジングラ	種	a	b	c	d	e	a	a
イ	膜厚 (μm)	4	5	7	7	5	4	6
表面	スマ-150 (μm)						1	
処理剤	アセタノン (μm)							1
合計膜厚 (μm)		4	5	7	7	5	5	7
性	造形性	○	○	○	○	○	○	○
能	防錆性	○	○	○	○	◎	◎	◎
試	溶断性	1級	1級	1級	1級	1級	1級	1級
驗	溶接性	ピット (個数/m)	0	0	0	0	0	0
	プロホール	○	○	○	○	○	○	○

[0031]

[Table 3]

		比較例						
		1	2	3	4	5	6	7
ジングラ	種	f	g	a	j	k	h	i
イ	膜厚 (μm)	7	6	2	25	15	5	2
表面	スマ-150 (μm)							
処理剤	アセタノン (μm)						1	1
合計膜厚 (μm)		7	6	2	25	15	6	3
性	造形性	×	×	×	◎	◎	×	×
能	防錆性	×	×	×	◎	◎	×	△
試	溶断性	1級	1級	1級	3級	2級	1級	1級
驗	溶接性	ピット (個数/m)	0	0	0	6	4	0
	プロホール	○	○	○	×	×	○	○

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the steel plate pretreatment approach that welding and fusing can be performed, without producing a defect, where a zinc primer is painted.

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EFFECT OF THE INVENTION

[Effect of the Invention] According to this invention, welding and fusing are attained by painting the zinc primer containing zinc dust with small particle diameter so that it may become a thin film, without producing a defect, also where a zinc primer is painted. If the finishing agent of a chromate system is furthermore applied on a zinc primer layer, since penetration rust-proofing nature will be raised in this zinc primer layer, it is suitable.

[0030]

[Table 2]

		実施例						
		1	2	3	4	5	6	7
ジンクプライ	種	a	b	c	d	e	a	a
マ	膜厚(μm)	4	5	7	7	5	4	6
表面	スラグ(μm)						1	
処理剤	マニグス(μm)							1
合計膜厚(μm)		4	5	7	7	5	5	7
性	造形性	○	○	○	○	○	○	○
能	防錆性	○	○	○	○	◎	◎	◎
試	溶断性	1級	1級	1級	1級	1級	1級	1級
験	溶接性	ピット (個数/m)	0	0	0	0	0	0
性	プロホール	○	○	○	○	○	○	○

[0031]

[Table 3]

		比較例						
		1	2	3	4	5	6	7
ジングラ イ	種	f	g	a	j	k	h	i
	膜厚(μm)	7	6	2	25	15	5	2
表面	スマ-150(μm)							
	処理剤						1	1
合計膜厚(μm)		7	6	2	25	15	6	3
性 能	造粒性	×	×	×	◎	◎	×	×
	防錆性	×	×	×	◎	◎	×	△
	溶剤性	1級	1級	1級	3級	2級	1級	1級
試 験 性	溶接 (個数/m)	0	0	0	6	4	0	0
	プロホール	○	○	○	×	×	○	○

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MEANS

[Means for Solving the Problem] this invention persons came to complete header this invention for welding and fusing being attained by painting the zinc primer containing zinc dust with small particle diameter so that it may become a thin film, without producing a defect, also where a zinc primer is painted, as a result of inquiring wholeheartedly that the above-mentioned problem should be solved. [0005] That is, this invention offers the steel plate pretreatment approach which paints and becomes a steel plate side so that it may become the range of 4-9 micrometers by desiccation thickness about the zinc primer constituent which contains (A) silicon system inorganic binder and zinc dust with a (B) mean particle diameter of 5 micrometers or less as a principal component.

[0006]

[Embodiment of the Invention] The zinc primer constituent used in this invention contains a silicon system inorganic binder (A) and zinc dust (B) with a mean particle diameter of 5 micrometers or less as a principal component.

[0007] The above-mentioned silicon system inorganic binder (A) Tetra-alkoxy silicate, alkyl thoria RUKOKISHI silicate, The initial condensate of hydrolysis to which the condensation reaction of dialkyl dialkoxy silicate, these partial condensation products, and/or them was carried out under existence of water and an acid catalyst can be used. As tetra-alkoxy silicate, for example Tetramethoxy silicate, Tetra-ethoxy silicate, tetra-propoxy silicate, tetra-isopropoxy silicate, Tetra-butoxy silicate, tetrapod iso butoxy silicate, ethyl silicate 40 (product made from Japanese KORUKO-TO), etc. are mentioned. As alkyl thoria RUKOKISHI silicate For example, methyl trimethoxy silicate, MECHIRUTORI ethoxy silicate, Methyl tripropoxy silicate, ethyl trimethoxy silicate, ECHIRUTORI ethoxy silicate, etc. are mentioned. As dialkyl dialkoxy silicate For example, dimethyl dimethoxy silicate, dimethyl diethoxy silicate, diethyl dimethoxy silicate, diethyl diethoxy silicate, etc. are mentioned. These are independent, or two or more sorts can use them, mixing. Moreover, moisture powder type colloidal silica and solvent distributed colloidal silica may be used together to the above-mentioned silicate.

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[0013] It paints and this invention approach becomes a steel plate side so that it may be set to 4-9 micrometers by desiccation thickness in the zinc primer constituent obtained as above-mentioned. Since welding and fusing nature are inferior when this thickness is inferior in film formation nature and anti-corrosiveness and exceeds 9 micrometers in less than 4 micrometers, it is not desirable. As for a steel plate side, it is desirable to remove rust, a scale, etc. Well-known means, such as an air spray, airless spray, and a brush, can perform paint of the above-mentioned zinc primer constituent conventionally.

[0014] It is suitable that a finishing agent is applied on it after painting the above-mentioned zinc primer constituent from the point of rust-proofing nature by this invention approach. As a finishing agent, a well-known thing is [that there is especially no limit] especially usable conventionally, and the finishing agent of a chromate system is suitable.

[0015] As a chromate system finishing agent, spreading mold chromate treatment liquid is mainly mentioned, a silica particle is added further and, specifically, the water-soluble organic macromolecule resin containing a carboxyl group and the thing which it comes to adjust to pH 2.0-3.5 can be used for the processing liquid which uses the water-soluble chromium compound of 1 - 100 g/l, and the sulfuric acid of 0.2 - 20 g/l as a principal component by chromium metal conversion. 20 - 40% of the weight of the range may be preferably suitable for this processing liquid 50 or less % of the weight, and the content of the chromium in a total chrome may be what added fluoric acid, the metal ion of optimum dose, for example, Zn²⁺, Co²⁺, Fe³⁺, etc. and other mineral acids, for example, a phosphoric acid, etc. to this if needed. As for this organic macromolecule resin, it is desirable that it is within the limits of mean molecular weights 1,000-500,000, for example, vinyl butyral resin, acrylic resin, etc. are mentioned and 5 - 15% of the weight of within the limits is usually suitable for the addition to the solid content in processing liquid at resin solid content. Although there are a dry type silica (fumed silica) and a wet silica (a silica sol, colloidal silica) in this silica particle, a dry type silica with few silanol groups can use it for a particle front face suitably. It is appropriate for the addition of this silica particle to choose so that it may become within the limits of 30 / 70 - 50/50 by the weight ratio to the amount of total chromes.

[0016] Well-known means, such as an air spray, airless spray, and a brush, can perform the method of application of the above-mentioned finishing agent conventionally, and about [200-400mg //m] two are suitable for the coverage.

[0017] It is suitable from the point of welding and fusing nature that the sum total thickness (desiccation thickness) of said zinc primer layer and the above-mentioned finishing agent layer is 10 micrometers or less in this invention.

[Translation done.]

*** NOTICES ***

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

EXAMPLE

[Example] Hereafter, an example is given and this invention is further explained to a detail. The "section" and "%", the "weight section" and "% of the weight" are meant, respectively.

[0019] The "ethyl silicate 40" (product made from Japanese KORUKO-TO) 100 section, the "Snow tex ST-0-33" (Nissan Chemical Industries, Ltd. make, SiO₂ 33% of moisture powder type colloidal silica) 20 section, and the ethanol 180 section were put into the example of manufacture manufacture 1 reaction container of a silicon system inorganic binder, it kept at 40 degrees C, and the 2-N hydrochloric-acid 0.4 section was dropped over 1 hour, stirring. After dropping termination, keeping at 40 degrees C, stirring was continued for 1 hour and the binder (A-1) (20% of solid content) was obtained.

[0020] The "ethyl silicate 40" (product made from Japanese KORUKO-TO) 100 section, the water 10 section, and the ethanol 130 section were put into the example of manufacture 2 reaction container, it kept at 40 degrees C, and the 2-N hydrochloric-acid 0.5 section was dropped over 1 hour, stirring. After dropping termination, keeping at 40 degrees C, stirring was continued for 1 hour and the binder (A-2) (20% of solid content) was obtained.

[0021] Each component shown in the binder obtained by the creation above of a zinc primer in Table 1 was blended, mixing and stirring of were done, and each zinc primer a-k was obtained. - (notes 1) (notes 11) of front Naka is as follows.

"LS-2":Mitsui Mining & Smelting coating chemical-industry company make, zinc dust, mean particle diameter of 3.5 micrometers (notes 2) "LS-4" : The Mitsui Mining & Smelting coating chemical-industry company make, (Note 1) Zinc dust, mean particle diameter of 4.2 micrometers (notes 3) "LS-6" : The Mitsui Mining & Smelting coating chemical-industry company make, Zinc dust, mean particle diameter of 6.5 micrometers (notes 4) "#F" : The Sakai Chemical Industry Co., Ltd. make, Zinc dust, mean particle diameter of 3.8 micrometers (notes 5) "#1" : The Sakai Chemical Industry Co., Ltd. make, Zinc dust, mean particle diameter of 5.0 micrometers (notes 6) "F-3000" : Made in Honjo Chemical, Zinc dust, mean particle diameter of 3.7 micrometers (notes 7) "F-500" : Made in Honjo Chemical, Zinc dust, mean-particle-diameter rutile powder of 7.5 micrometers (notes 8) : KINTEIMA tex company make, Mean-particle-diameter [of 10.0 micrometers (notes 9)] detailed rutile powder: KINTEIMA tex company make, mean-particle-diameter silica powder: Takehara chemistry company make and mean-particle-diameter [of 5.9 micrometers (notes 11)] detailed silica powder: Takehara chemistry company make, mean particle diameter of 4.1 micrometers [0022] of 1.0 micrometers (notes 10)

[Table 1]

シングルライヤー	a	b	c	d	e	f	g	h	i	j	k
組成	A-1		40	40	40	40	40	40	40		35
	A-2	40								40	
	LS-2 (注1)	60		30	40						
	LS-4 (注2)								35		
	LS-6 (注3)						40	35			65
	#1 (注4)									60	
	#F (注5)	60									
	F-3000 (注6)				60						
	F-600 (注7)					60					
	研磨粉						10				
微細シリカ 粉			10						15		
シリカ 粉							15				
微細シリ カ粉				5							

[0023] Each zinc primer obtained by the one to paint examples 1-5 and example of comparison 5 above was added at this if needed, viscosity control of the ethanol was carried out, it painted with the air spray, it dried in ordinary temperature for seven days, and each color card was obtained so that it might become the thickness shown in Tables 2 and 3 on a test panel (it changes with performance tests) (desiccation). The following performance test estimated each obtained color card. A result is shown in Tables 2 and 3.

[0024] If needed, add ethanol to this and viscosity control of examples 6 and 7 and the example 6 of a comparison, and each zinc primer obtained by the 7 above is carried out to it. The finishing agent which paints with an air spray and is shown subsequently to this table after desiccation so that it may become the thickness shown in Tables 2 and 3 on a test panel (it changes with performance tests) (desiccation) was applied with the air spray so that it might be set to 1 micrometer by thickness (desiccation), and it dried in ordinary temperature for seven days, and each color card was obtained. The following performance test estimated each obtained color card. A result is shown in Tables 2 and 3. In addition, the (notes 12) of front Naka and the (notes 13) are as follows.

"KOSUMA 150":Kansai Paint [Co., Ltd.] make, a chromate-treatment agent (notes 13)

"ARUDEKKUSU": (Note 12) Japanese SHIBI chemical company make, a chromate treatment agent (performance test)

(*1) Film formation nature : visual observation and the thickness measurement (20 places/(sheet)) by the

electromagnetic thickness gage estimated the film formation nature of the color card which was ground by sandpaper #1000 and which was polished and was obtained as above-mentioned, using a mild steel plate (150x70x1mm) as a test panel.

[0025]

It is exterior homogeneity, standard deviation is or less 10:exterior homogeneity, and standard deviation exceeds 1. : O With an or less 2**:exterior ununiformity It is remarkably uneven and a steel plate base is accepted. and standard deviation -- 2 -- exceeding -- a less than [3] x:exterior -- And rust-proofing nature to which a standard deviation exceeds 3 (*2): The salt spray test (JIS 5400 9.1) was presented with the color card obtained as above-mentioned, using the steel plate (150x70x3mm) which carried out shot-blasting processing as a test panel for 100 hours, and the generating condition of rust was evaluated.

[0026]

O : -- completely -- abnormalities-less O: -- rusting -- ***** -- small -- generating **: -- about the color card with which **** obtained the steel plate (SM50A) whose generating x:**** is generating (*3) fusing nature:300x100x12mm remarkably as above-mentioned, using as a test panel what carried out shot-blasting processing The laser cutting machine "TF2500" (made in the Tanaka factory) was used, the rupture test was performed with 1m cutting speed for /, and the granularity of a cutting plane was evaluated in accordance with the criteria of granularity shown in WES2801.

[0027]

About the color card obtained as above-mentioned, using as a test panel what exceeded : with a class [the / 2nd] of the class [1st] : 50 or less s 50s, exceeded : with a class [the / 3rd] of 100 or less s 100s, and carried out shot-blasting processing of the less than [200s] (*4) weldability:300x100x12mm steel plate (SM50A) The welding wire "SF-1" (Japanese iron welding operator business company make) was used, the weld examination was performed the condition for 1m/of speed of travel with the water flush-fillet-welding posture of carbon-dioxide-gas welding process, and the number (per m) of the pit generated in the 2nd bead and the generating number (per m) of a blowhole estimated.

[0028]

O : more than less than [more than less than / 10 piece / **:10 30 piece] x:30 piece

[Translation done.]